ICWater and the West Virginia Chemical Spill by Bill Samuels

On January 9, 2014, an estimated 7,500 gallons of 4-methycyclohexane methanol (MCHM), which is used in coal processing, leaked from a ruptured container into the Elk River. The spill, just one mile upstream from a water-treatment plant, forced officials to ban residents and businesses in nine West Virginia counties from using the water for anything other than flushing toilets or fighting fires. An estimated 300,000 West Virginia residents were affected by the spill. The Incident Command Tool for Drinking Water Protection (ICWater) was used to model time-of travel and concentration of MCMH. It was designed to answer four critical questions: (1) where is the contaminant going, (2) is there a drinking water intake in its path, (3) when will it reach drinking water and (4) is its level high enough to be a human threat. ICWater uses the National Hydrography Dataset Plus (NHDPlus) river network for downstream and upstream tracing of contaminants. The NHDPlus contains more than 3 million stream and river reaches, all hydrologically connected. Mean flow volume and velocity are attributes of each reach in the network. USGS real-time stream flow gauges are linked to the network to update the mean flows and velocities to reflect actual conditions. The difference between the updated mean velocity in ICWater and the measured velocity on the Kanawha River (USGS gauge 03198000, just downstream of the spill and Charleston, WV intake) was less than 3 percent. The system also contains locations of industrial and municipal dischargers such as the spill site on the Elk River. It is also linked to the EPA Safe Drinking Water Information System to provide data on population served by each water utility downstream of the spill. Downstream tracing was initiated at the spill site to forecast the location of the leading edge, peak concentration and trailing edge of the plume for drinking water intakes as far downstream as 200 miles. The Greater Cincinnati Water Works (GCWW) collected water samples on the Ohio River to monitor for the presence of MCMH. GCWW also performed ICWater model runs based on MCHM measurements at downstream locations on the Ohio River to provide more accurate forecasts to nearby water intakes. GCWW shut down its intakes shortly before midnight on Tuesday, January 14 as a precautionary measure to protect its drinking water supply. The water utility re-opened it intakes at approximately 2 pm on January 16. Data for Cincinnati showed good agreement (within several hours) between the observed peak time of arrival and the model estimated peak time. The leading edge predictions were also close to the observations.

Elevation-Hydrography Meeting

The USGS National Geospatial Program hosted a meeting on elevation-hydrography integration December 4-5, 2013 in Reston, Virginia. In attendance were many USGS and consulting experts in elevation and hydrography data. The objective of the meeting was to discuss user needs for elevation-hydrography integration and the status of ongoing integration efforts in order to develop recommendations to the USGS National Geospatial Program on directions and next steps for advancing integration of elevation and hydrography data themes of The National Map over the next several years. Water Science requires the use of both hydrography and elevation data and to be fully successful these data need to be integrated. Other geospatial programs such as the US Topo can also benefit. An independent elevation and hydrography program in the National Geospatial Program has been suitable up to the present, but from now on there must be an integrated component in these programs to meet the needs of scientists. The goal was to develop a strategy for the future that will meet the objective for integrated data that meets user needs.

Seven strategies were developed for moving forward. National Geospatial Program leaders tasked the

group to proceed with strategy 2A or 2B in the near term (next five years) and strategy 6 in the future (five to ten years). This will guide the USGS in developing guidance for out-year fiscal year planning. A brief summary of the seven options are as follows. A complete understanding of the seven options will involve further study in subsequent meetings and may yield sub-options.

Option 1: Do what we are doing now. Develop 24K-5K NHD/WBD and 10m-1m 3DEP with some cross-use, but more-or-less independently of each other. Integration is incidental.

Option 2A: Develop 24K-5K NHD/WBD and 10m-1m 3DEP. Generalize the NHD and 3DEP to 24K and 10m respectively. Process into High Resolution NHDPlus. Use NHD to modify 3DEP. Deliver NHDPlus, WBD, modified 3DEP, and standard 3DEP. Integration will by hydro-based.

Option 2B: Develop 24K-5K NHD/WBD and 10m-1m 3DEP. Do not generalize, but use best available data. Process into High Resolution NHDPlus. Use NHD to modify 3DEP. Deliver NHDPlus, WBD, modified 3DEP, and standard 3DEP. Integration will be hydro-based.

Option 3: Generate entirely new NHD/WBD from 10m-1m 3DEP using automated flow grid methods. Existing NHD will be used to seed network. Conflation required. Deliver NHDPlus (or similar to NHDPlus), WBD, and standard 3DEP. Integration will be elevation-based.

Option 4: Update existing 24K-5K NHD/WBD from 1m 3DEP using semi-automated processes. Deliver updated NHD/WBD, and standard 3DEP. Integration will be elevation-based.

Option 5: Update existing 24K-5K NHD/WBD hybrid approach from imagery using manual processes, and 1m 3DEP using automated flow grid processes manually seeded. Deliver updated NHD/WBD, and standard 3DEP. Integration will be elevation-based.

Option 6: Use LiDAR/IfSAR to simultaneously produce new NHD, WBD, and 3DEP. Enhance breaklines to include all NHD and WBD features. Deliver 5K NHD/WBD and 1m 3DEP. Integration through simultaneous production.

Streamer Update by Jay Donnelly and Florence Thompson

The next edition of Streamer, the national stream network navigation application, is in testing this month and will be ready soon. Major changes to this release include:
- the addition of real-time streamflow stations symbolized by current conditions (Updated Hourly)
- a display toggle for next-generation radar (Nexrad),
- the full use of Geographic Names Information System data in the place names search, and
- reports that include the waterbodies and congressional districts traversed in a trace.

Be sure to see Streamer at http://nationalatlas.gov/streamer/Streamer/welcome.html

NHD Stewardship Assessment by Steve Aichele

The USGS will be interviewing NHD stewards and substewards during February to better understand the strengths and weaknesses of the stewardship program. The results of the Stewardship Assessment will be used to guide future direction of the stewardship program. Stewards will be contacted by their NHD Point of Contacts or Geospatial Liaison to arrange a time and answer any preliminary questions stewards might have.

US Forest Service Eastern Region formally adopts NHD and WBD as authoritative datasets by Joe Miller

Acknowledging the importance of consistent and complete hydrographic and watershed data and the need to more efficiently allocate resources to data management, the Eastern Region of the U.S. Forest Service formally adopted NHD and WBD as authoritative datasets. The Eastern Region (or Region 9) of the U.S. Forest Service covers the 20 states between Minnesota and Missouri to Maine to Maryland, with 15 National Forest units within 13 of those states. With the historic investment in NHD and WBD development and the use of NHD and WBD corporately, it was time to formally move to this new policy. As a result of this new policy, the Eastern National Forest units will be seeking to develop stewardship agreements with their respective lead state NHD and WBD stewards. Work has already begun, with 6 of the 15 units already having NHD agreements in place. The purpose of these agreements is to acknowledge a formal relationship with the lead stewards, and authorize the Forest Service as NHD Editors for watersheds containing National Forest land. The Region is planning to have NHD Edit tool training soon and looks forward to working with state partners on more stewardship agreements for NHD and WBD. For more information, please contact Joe Miller, USFS Eastern Region, at jbmiller@fs.fed.us.

Alaska Hydrography Technical Working Group by Becci Anderson

The Alaska Hydrography Technical Working Group, or AHTWG, is a committee focused on the coordination of current and future surface water hydrography mapping in Alaska. AHTWG is charted under the Alaska Climate Change Executive Roundtable, and is comprised of six federal agencies- U.S. Forest Service, U.S. Geological Survey, National Park Service, U.S. Fish and Wildlife Service, National Oceanic and Atmospheric Administration, and Bureau of Land Management- and four State of Alaska entities- Department of Environmental Conservation, Department of Fish and Game, Department of Natural Resources and the University of Alaska.

The group is currently chaired by the USGS with a Vice-Chair from Alaska Department of Natural Resources. AHTWG currently has three Focus Groups comprised of AHTWG members working in special sessions working to develop Hydrography Data Model Standards, Hydrography Data Editing Standards, and developing Communications Materials. AHTWG has adopted AK Hydro as the preferred path forward to support hydrography mapping updates in Alaska. See: http://seakgis.alaska.edu/ahtwg/

For more information about the group, please contact AHTWG Chairperson Becci Anderson (rdanderson@usgs.gov), AHTWG Vice-Chairperson Wendy Steinberger (wendy.steinberger@alaska.gov)

Cartographic Generalization 3 Years Later - Why is USGS Generalizing the Same State Twice? by Ariel Doumbouya

In FY2011 cartographic generalization was performed on New Jersey for US Topo Production. Since that time, not only has the method of cartographic generalization changed, giving the USGS better results, but the NHD data itself has also changed.

US Topo quadrangles are digital topographic maps produced by the National Geospatial Program of the USGS. The US Topo product is designed to provide the public with the most current, accurate data, at a nationally consistent 1:24,000-scale. Thus the USGS NHD Production Unit needed to process the most current, accurate data for the state of New Jersey to a 1:24K-scale. Since the first round of US Topo production for New Jersey there have been many updates. The USGS partners in New Jersey have

continued adding local resolution NHD data using 2009 aerial photography, and USGS continues data validation updates (image integration, maintenance lite II, GNIS updates, and flow checks fixes).

In addition, over the last three years major improvements have been made to the cartographic generalization tools making them more efficient, user friendly, and streamlined for production operations. Overall the biggest accomplishments made include updating the tools from the use of AML and coverages to the use of python and geodatabase feature classes.

There are four primary generalization processes. Enrichment prepares the data for generalization, pruning removes features, simplification removes vertices and validation verifies results. Improvements to the enrichment process include creating a batch enrichment tool from model builder and a new method of creating density partitions, used to prune the data. The batch enrichment tool has decreased processing time by reducing the amount of user input required. The USGS is now also pruning the data based on calculated subbasin target density values, versus applying a statewide average target density. This allows the USGS to preserve more of the natural variation that occurs in and across the subbasins. The method of calculating the target density values has changed from a formula to a ratio based on the archived 24K-scale data density. The process of calculating target density continues to encompass the majority of the work involved for cartographic generalization. This new method is straightforward, simple, and reduces the chance for error in calculations. The pruning tools have also been improved to preserve the full reach for any GNIS named features. This eliminates the issue of missing named headwaters on the US Topo. The simplification tools have been greatly improved, providing an easy to use interface and tools that run on an entire subbasin in just a few minutes. The simplification tools continue to use the bend simplification method for removal of vertices, but the tool now allows a quick interface for entering bend simplification tolerances per density partition.

Even with all of the improvements, there are still many important questions to be asked in relation to generalization. How does generalization designed for hydrologic modeling factor in? Will the addition of value added attributes to the high resolution database change how the USGS currently performs generalization? Is there a way to automate even more of this process? How does the USGS address tough problems like changing dimensionality of polygon to linear features? How does the USGS account for man-made features such as canals and pipelines? Look for answers to these questions in the months to come.

Network Improvement Project Status by David Kraemer

The current status for the three Network Improvement Project components is:
1. Network Improvement Double Check: Charles Bowker is editing Region 18, Allen Karsh is editing Region 02, and Dave Kraemer is editing Region 07. Preparing Regions 03 and 09 by running the EPA QC check software at the Sub-Region level. Then determining which Sub-Basins will need to be edited and what checks have severe errors.
2. Alaska Initial Network Improvement: Allen Karsh is completing Sub-Region 1903 before Network Improvement goes dormant in Alaska, while the Double Check edits are completed.
3. Uncompleted Initial Network Improvement Sub-Basins outside Alaska Checked-Out by States:
   - Florida (03090205)
   - Alabama (03160205)
   - Indiana (05120111, 05120113, 05120201, 05120202, 05120206, 05140104)
   - Louisiana (08040207, 08040302, 08080101, 08090203, 08090302)
   - Mississippi (08030202 and 08030207)

As States check-in their jobs the USGS will edit these uncompleted initial Network Improvement Sub-Basins.

Watershed Boundary Dataset by Stephen Daw

2014 is going to be an excellent year for the Watershed Boundary Dataset. Great updates are pouring in from all over the country making the WBD better than ever. The USGS expects to see many updates along the borders with Mexico and Canada, in Alaska, along the coasts, and everywhere the WBD is being updated with LiDAR and IfSAR. The USGS also expects to see some improvements to the WBD tools and most importantly, in the spring, a release of an ArcGIS 10.2 version.

The USGS plans on providing monthly training classes via WebEx on (1) the Stewardship Website, (2) the WBD edit tools, (3) the Add-In tools, and (4) a class on tips and tricks for editing the WBD. Please contact Stephen Daw (sgdaw@usgs.gov) if you would like to participate in any one of those classes.

Also in 2014 the USGS is starting a monthly Technical Exchange Meeting (TEM). The call will occur on the second Wednesday of every month and is your opportunity to talk to the WBD point of contact and other stewards about technical issues related to editing the WBD. These issues can include bugs in the tools, areas where you would like to see improvement in the tools, work-around for problems with ArcGIS, tips and tricks that make editing the WBD easier, about any other question related to updating the WBD and that process. Contact Stephen Daw for more information.

Downloads of NHD Data from the USGS in December

During December there were 4,508 ftp downloads. This is broken into 1,840 downloads of statewide high resolution NHD and 197 medium resolution downloads. There were 2,272 subregion-based high resolution downloads and 199 medium-resolution downloads. Usually there are an equal number of National Map Viewer downloads, but these are no longer being reported.

2014 AWRA Spring Specialty Conference GIS and Water Resources VIII – Data to Decisions

Geographic Information Systems (GIS) are an indispensable tool in providing timely and accurate information necessary for making excellent water resources decisions. Emerging technologies in data collection, information management, web and cloud services, and visualization have opened up significant new avenues for sharing solutions across local, state, federal, and international levels. Come and discover new solutions for your organization. The conference is May 12-14, 2014 at the Snowbird Resort in Snowbird, UT. See http://www.awra.org/meetings/SnowBird2014/

NHD Photo of the Month

This month's photo was submitted by Jon Becker of the EPA. It is the Okefenokee Swamp in South Georgia. More specifically these were taken on the Suwannee River in the Okefenokee National Wildlife Refuge just downstream of Stephen Foster State Park in South Georgia. See ftp://nhdftp.usgs.gov/Hydro_Images/Okefenokee.JPG. Submit your photo for the NHD Photo of the Month by sending it to kyoder@usgs.gov. This will allow the program to build a library of real-world photos linked to the NHD.

December Hydrography Quiz / New January Quiz

Joseph Kerski of Esri was the first to guess the December NHD Quiz as the New Madrid meander in the Mississippi River in far Southwestern Kentucky/Northwestern Tennessee. See ftp://nhdftp.usgs.gov/Quiz/Hydrography101.jpg The area of land inside the meander actually belongs to

Kentucky and is detached from the rest of the state by the river and Missouri.

Joseph joined Esri in 2006 as an education manager focusing on thought leadership in geospatial technology and education. His areas of interest include GIS-based curriculum development, research in the implementation and effectiveness of GIS in education, teaching professional development institutes for educators, and fostering partnerships and communication that promote and support GIS internationally in both formal and informal education at all levels. Previously he worked for 22 years at NOAA, U.S. Census Bureau, and USGS.

Others with the correct answer (in order received) were: Al Rea, David Straub, Linda Davis, Nicole Eiden, Elizabeth Smith, Bob Denouden, Calvin Meyer, Troy Blandford, Evan Hammer, Diego Portillo, Jonathan Labie, Jon Becker, Richard Patton, Amy Prues, Roger Barlow, Tom Christy, Kitty Kolb, Charley Hickman, Jim McDonald, Matt Rehwald, Ellen Lesch, Daniel Button, Laurie Morgan, Joanna Wood, Edwin Abbey, Janet Kellam, Bernie Sroka, Jim Seay, Dennis Dempsey, Janet Brewster, Ken Koch, Nick Schmal, William Hansen, Jeanne Riley, David Asbury, and Thomas Denslinger.

This month's hydrography quiz can be found at ftp://nhdftp.usgs.gov/Quiz/Hydrography102.pdf. Where is this island formed by the East and West branches of a river connecting two major lakes? Send your guess to jdsimley@usgs.gov.